

REMARKS

Claims 2, 4-7, 10-11, 13-14, 16-17, 19-20, 22-23, and 25-33 are pending in the present application. Claims 4-7, 11, 13-14, 17, 19-20, 23, and 25-33 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Itoh *et al* (U.S. Patent No. 5,564,958; hereinafter Itoh) in view of Sakano (JP 2-299129). Claims 2, 10, 16, and 22 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Itoh in view of Sakano and further in view of Konuma and Watkins. Claims 4-7, 17, 19, 20, 23, 25-27, and 32-33 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakano in view of Itoh. Claims 11 and 13-14 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakano in view of Itoh and further in view of Garcia (U.S. Patent No. 5,521,461). Claims 28-31 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakano in view of Itoh and further in view of Konuma and Watkins. Applicant respectfully requests reconsideration by the Examiner in view of the following remarks.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. That is, there must be something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561 (Fed. Cir. 1986). In fact, the absence of a suggestion to combine is dispositive in an obviousness determination. *Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573 (Fed. Cir. 1997). Applicant respectfully submits that the cited references do not contain any suggestion or motivation to modify the reference or to combine reference teachings in the manner proposed by the Examiner and therefore the Examiner has failed to make a *prima facie* case that the present

invention is obvious. Moreover, the cited references appear to teach away from the claimed invention.

Claims 4 and 11 of the present application are directed to a method of manufacturing a field emission device comprising operating the field emission device for at least approximately 15 minutes at a pressure of at most about 10^{-8} Torr to evacuate outgassed materials, and sealing the field emission device. Claims 17 and 21 in the present application are directed to a field emission device formed by a method comprising operating the field emission device at a pressure of at most about 10^{-8} Torr for at least approximately 15 minutes to evacuate outgassed materials and then sealing the field emission device.

The Examiner alleges that the field emission device taught by Itoh is substantially identical to the device formed by the method claimed in the present invention. Applicant respectfully disagrees and submits that the field emission device taught by Itoh is a conventional device that shares characteristics with the conventional field emission devices described in the background section of the specification. For example, conventionally manufactured field emission devices running under standard conditions of about 10^{-5} Torr to about 10^{-6} Torr may show severe tip degradation after running for less than 100 hours. See Patent Application, page 8, ll. 3-16. The display device taught by Itoh also has a survival rate of about 80 hours. See Itoh, col 6, ll. 5-14 and Figure 6.

Moreover, the present invention, as set forth in independent claims 4, 11, 17, and 23, may remove monolayers of carbon-based materials from the anode before the final seal that pinches off a tube used during the tubulation process to evacuate a field emission device. The monolayers of carbon-based materials are formed when carbon is adsorbed and/or absorbed on the tips of the emitter sites. Removing the monolayers may result in a lower work function ϕ and,

consequently, a higher emission current over time, reducing degradation and increasing the effective lifetime of the emitter tips and the associated field emission devices. See Patent Application, page 8, ll. 3-14. In contrast, the display device taught by Itoh includes adsorbed carbon layers. For example, Itoh teaches that when the display device includes a field emission cathode, it is advantageous to introduce gases such as CH_4 , C_2H_6 , and the like into the display device to permit adhesion of carbon to a distal end of an emitter of a conical shape, purportedly leading to a decrease in work function and an advantageous increase in emission current. See Itoh, col. 7, ll. 35-42.

For at least the aforementioned reasons, Applicant respectfully submits that the field emission display device formed according to the process claimed in the present invention is not identical to the field emission device described by Itoh.

The Examiner also alleges that Itoh, as modified by Sakano, teaches operating the field emission device for at least approximately 15 minutes at a pressure of at most about 10^{-8} Torr to evacuate outgassed materials and then sealing the field emission device. Applicant respectfully disagrees. Itoh utilizes a process of introducing a reducing gas into the display device, holding the reducing gas in the display device for several minutes, and then evacuating the display device to about 10^{-5} Torr. After several repetitions of this process, the pressure is reduced to about 1×10^{-7} Torr and the tube is sealed. See Itoh, col. 5, ll. 14-17.

Itoh, however, does not teach or suggest operating the field emission device for at least approximately 15 minutes while the pressure is at most about 10^{-8} Torr. To the contrary, Itoh appears to teach away from the claimed process by teaching that simply activating the device while evacuating the tube "fail[s] to sufficiently discharge gas from the display device." Moreover, Itoh appears to teach away from the present invention by teaching that it is

advantageous to introduce gases such as CH₄, C₂H₆, and the like into the display device to permit adhesion of carbon to a distal end of an emitter of a conical shape, leading to a decrease in work function and resulting in an advantage of increasing and emission current. See Itoh, col. 7, ll. 35-42. As discussed above, operating the field emission device for at least approximately 15 minutes while the pressure is at most about 10⁻⁸ Torr is intended to *remove* monolayers of carbon-based materials from the anode. It is by now well established that teaching away by the prior art constitutes *prima facie* evidence that the claimed invention is not obvious. See, *inter alia*, *In re Fine*, 5 U.S.P.Q.2d (BNA) 1596, 1599 (Fed. Cir. 1988); *In re Nielson*, 2 U.S.P.Q.2d (BNA) 1525, 1528 (Fed. Cir. 1987); *In re Hedges*, 228 U.S.P.Q. (BNA) 685, 687 (Fed. Cir. 1986).

To remedy these fundamental deficiencies in the primary reference, the Examiner relies on Sakano to teach operating one or more cathodes for 40 minutes each to degas control and focusing electrodes, and operating the cathodes for 20 minutes to degas a faceplate of the field emission device. However, as admitted by the Examiner, Sakano is completely silent with regard to a pressure to be used during the degas process. The cited references set forth many possible pressures and Applicant therefore submits that the cited references do not provide a suggestion or motivation to modify the prior art in the specific manner set forth by the Examiner. In particular, there is no suggestion or motivation in the prior art to operate the display device taught by Itoh for 20-40 minutes after the pressure inside the display device has been reduced to about 1x10⁻⁷ Torr. Instead, the Examiner has apparently used the present application as a road map for the Examiner's proposed modifications to the prior art.

For at least the aforementioned reasons, Applicant respectfully submits that claims 4-7, 11, 13-14, 17, 19-20, 23, and 25-33 are not obvious over Itoh in view of Sakano and request that the Examiner's rejections of these claims under 35 U.S.C. § 103(a) be withdrawn. Moreover,

Applicant respectfully submits that Garcia, Konuma, and Watkins fail to remedy the fundamental deficiencies of Itoh and Sakano. Thus, Applicant respectfully submits that claims 2, 10, 16, and 22, which depend from claims 4, 11, 17, and 23, respectively, are also allowable over the cited references and requests that the Examiner's rejections of these claims under 35 U.S.C. § 103(a) be withdrawn.

For at least the aforementioned reasons, Applicant respectfully submits that all claims pending in the present application are allowable over the cited references. If the Examiner has any questions or comments, or if a telephone conference would facilitate disposition of this case, he is encouraged to contact the undersigned by telephone at (713) 934-4060.

Respectfully submitted,



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